The Star

Closing gaps in maths and science

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TO improve performance in mathematics and science, educators and learning materials need to transmit excitement of the subjects to students.

Referring to the Trends in International Mathematics and Science Study (TIMMS) 2019, International Association for the Evaluation of Educational Achievement (IEA) executive director Dr Dirk Hastedt said students who liked the subjects scored significantly higher than those who didn't.

In fact, the over 100-score point difference translated to more than a year of learning.

"It's very important that students like learning these subjects," he stressed, adding that learning materials should be designed to engage both boys and girls to narrow the gender gap seen in TIMMS 2019, where girls outperformed boys in many countries, including Malaysia.

Hastedt also said students' self-confidence in mathematics and science strongly correlates with their achievement, with more than a year of learning separating those with confidence from those without in the same study.

"What we can see from our data is that learning materials need to be targeted and supported by positive attitude to these subjects.

"We need students with a 'can do' attitude," he asserted.

He added that it is important to have prerequisites such as language mastery.

“From our Progress in International Reading Literacy Study (PIRLS), we can see an increasing percentage of boys struggling with language.

“If you don’t have language capacity, it’s more difficult to learn mathematics and science,” he said.

Other strategies Hastedt recommended for improving student performance include incorporating software tools in learning and providing support for underprivileged students.

“Some students may understand better when using learning software managed by teachers. This enables more individualised learning,” he said.

However, he emphasised that this requires not only the availability of computers but also the presence of software administrators and technical support in schools – more importantly, teachers trained in using digital devices efficiently in teaching.

He also said digitalised instruction requires more than just transferring paper materials into a digital format.

“New digital materials that are engaging and helpful need to be developed. It requires a support structure and teachers need to be trained to use the software and help students learn in a digital environment,” he said.

Hastedt added that it’s important to move international assessments to the same digital format used in teaching and learning.

Cognisant of the need to keep up with the times, the IEA, which conducts TIMMS, introduced its fully digitised version, eTIMMS, in its 2023 cycle, he shared.

“We have to recognise that students today engage with the digital world through digital media and mobile phones. They find this more engaging than traditional methods. We have to keep up with the interest,” he said.

Hastedt, however, cautioned that digitalisation could exacerbate gaps in learning.

Citing a study on digital competencies, he said the gaps between different socioeconomic groups are huge – “larger than for reading, mathematics and science”.

“Digital competencies are not always well covered in countries’ curricula, and teachers sometimes don’t teach these competencies,’ he said.

A focus, he emphasised, is needed on the most vulnerable student groups as early as possible, starting from kindergarten or the early grades.

Citing a TIMMS study that highlights a difference of more than one year of learning between students from disadvantaged and affluent backgrounds, he noted that in Malaysia and many other countries, students with challenging socioeconomic backgrounds struggle more often with mathematics and science achievements.

“A focus on supporting students from lower social economic background would not only benefit these students, but also enhance the overall achievement of all students due to the positive peer effect.

“And if teachers can concentrate on all students because of a good level of knowledge, that benefits all students in the country,” he concluded.